

2.0 REMEDIAL DESIGN

2.1 SUMMARY OF SITE ORDNANCE AND EXPLOSIVES REMEDIATION

The Tourtelot OE Remediation Project will investigate, detect, identify, and remove OE, OE scrap, and non-OE metallic debris from the Project Site. OE may be present on the entire Project Site except a portion of the bottom of the North Valley TNT sloping hillsides. Project Site OE remediation will consist of six significant coordinated activities, including:

- Surface preparation
- Point clearance of all detected anomalies across the entire Project Site, including appropriate disposal of any OE, OE scrap, and non-OE items
- Homogenization, excavation, and potential stockpiling for disposal of TNT-affected soil with TNT concentrations at or above 10 percent by weight
- Evaluation of ordnance data collected on the Project Site during OE point clearance
- Areawide clearance in order to assure clearance of OE from areas that are planned for future residential use in the South and North Valleys and on the Ridge where OE may be present after point clearance
- Grading to provide OE-free, clean, crushed bedrock below final site grades in future residential areas of the property.

The Project Site has been divided into sectors to facilitate prioritization of an OE clearance and sequencing of associated tasks. Figure 2-1 presents the sector boundaries and significant features within each sector. Table 2-1 presents a description of each sector.

The six activities that will comprise the OE remediation are described in the following paragraphs. Detailed tasks associated with each of these activities are discussed in Chapter 4.0.

Surface preparation includes vegetation clearance, interior fence removal, removal and disposal of nonhazardous construction debris, and surveying and marking of grids used to control/track the progress of OE clearance activities.

As used in this OE RDD, the term “point clearance” refers to an OE cleanup approach that locates and removes individual surface and subsurface metallic anomaly sources. Point clearance will be performed over the entire Project Site

1 and comprises a surface clearance to remove OE, OE scrap, and other metallic
2 debris from the surface; geophysical survey of all areas to detect and map
3 potential OE; intrusive investigation of mapped anomalies; followed by a QC
4 check consisting of a 100-percent remapping of the Project Site; and removal of
5 any discovered anomaly sources. QA will include an internal review of the field
6 data and an independent review and analysis of the geophysical and intrusive
7 investigation results by a third-party entity.
8

9 At the completion of the point clearance and QA activities for Sector 9, TNT-
10 affected soils in areas where the concentrations of TNT are potentially equal to
11 or exceed 10 percent by weight will be homogenized. It has been
12 conservatively assumed for the remedial design, based on RI data, that the TNT
13 concentrations equal to or greater than 10 percent are confined to the
14 unvegetated portions of the TNT Strips. Once these soils have been
15 determined safe to move (i.e., below explosives limits) by confirmation
16 sampling, they will be transported to an off-site landfill that is permitted to
17 receive the TNT-affected soils.
18

19 At the completion of point clearance and QA/QC activities throughout the entire
20 Project Site, an evaluation of the distribution of OE and OE scrap at the Project
21 Site will be performed for the purpose of developing a final site conceptual
22 model that will be used for assessing if it can be concluded that any areas of the
23 Project Site are not suspected of containing OE below the depth of the point
24 clearance and QC scans and, therefore, will not require areawide clearance.
25

26 Areawide clearance includes the removal of soil in future residential areas that
27 contains or has the potential to contain OE, as determined by the final site
28 conceptual model. In addition, if outlier OE items are identified, an area within
29 200 feet of an outlier (Additional Scan Area) will be areawide cleared if the area
30 is within a future residential area. An outlier is defined as an OE item located in
31 an area that would not otherwise be considered to have the potential to contain
32 OE.
33

34 Areawide clearance soils will be scanned in lifts before they are excavated and
35 will be scanned again in lifts after placement in the North Valley. Any anomalies
36 detected will be removed through point clearance. The depth of the lifts will be
37 6 inches less than the reliable depth of the geophysical instrument. Lifts will be
38 geophysically scanned, cleared of anomalies, excavated, placed in the North
39 Valley in 8-inch lifts, and scanned again. The criteria for ceasing scanning will
40 be finding two consecutive clear lifts. A clean lift is a lift that does not contain
41 any OE or OE scrap items. The presence of two clear lifts means that soil
42 beneath the second clear lift is no longer suspected of containing OE. The
43 criteria for ceasing scanning is fully described in Chapter 3.0.
44

45 A PPP (Granite Management Corporation, September 1999) has been
46 developed for the Project Site. Project personnel will participate in public
47 meetings to discuss project progress and activities in accordance with the PPP.
48

1 Prior to initiation of any proposed activities, businesses and residents near the
2 Project Site will be informed of the proposed project activities in accordance with
3 the MSAP (Appendix B). This notification will include information on a 24-hour
4 public information telephone line that will be established and maintained to
5 provide updated information on project activities, including information on
6 planned or accidental detonations of OE, if applicable. The telephone line will
7 also allow residents and businesses to express concerns or ask questions
8 regarding project activities. All appropriate city, county, state, and federal
9 officials will also be kept informed by direct mail and telephone notification.

10 11 **2.2 SURFACE PREPARATION**

12 13 **2.2.1 Surface Preparation**

14 15 **2.2.1.1 Vegetation Clearance.**

16
17 To prepare the Project Site for surface clearance activities and geophysical
18 mapping, the area will be cleared of vegetation to a height of 6 inches or less to
19 enhance ground visibility and facilitate site access. The majority of the
20 vegetation will be removed by mechanical means (e.g., self-propelled and/or
21 tractor-pulled mowing equipment). Most of the jurisdictional wetlands in the
22 South Valley (approximately 2 percent of the site) will be cleared by a crew
23 using hand-held manual and/or gasoline-powered equipment.

24 25 **2.2.1.2 Soil Stockpiles.**

26
27 All previously stockpiled construction debris from the Project Site will be
28 removed during the surface preparation phase, including construction debris
29 from Unit D-1, the Ridge, and the North Valley stockpiles (Figure 2-2). The soils
30 mixed in with the construction debris will remain at each stockpile location until
31 they can be point cleared for OE. Following the point clearance of stockpile
32 soils, the soil will either be moved and stockpiled in Sector 10B and/or Sector 7
33 or will be loaded into trucks and taken to a suitable landfill for disposal.

34 35 **2.2.1.3 Fencing.**

36
37 Any fencing on the interior of the Project Site will be removed during the site
38 preparation. Exterior fencing will also be temporarily removed (and replaced as
39 soon as possible) to facilitate geophysical mapping around the borders of the
40 site.

41 42 **2.2.1.4 Surveying of Grids.**

43
44 Survey crews will lay out a 100-foot by 100-foot grid pattern on the entire Project
45 Site using corner stakes to indicate grid corners. The grid system will allow
46 geophysical and OE surface and subsurface clearance crews to accurately track
47 their progress as they locate and clear OE, OE scrap, and non-OE metallic
48 debris from the Project Site.

1 **2.3 ORDNANCE AND EXPLOSIVES REMEDIATION**

2
3 OE remediation will be accomplished through detection and removal of metallic
4 anomaly sources from the Project Site using OE clearance activities that include
5 OE surface clearance, geophysical investigation and mapping, and OE
6 subsurface clearance. QC verification will include geophysical remapping of the
7 entire Project Site and, as necessary, further OE subsurface clearance activities.
8 These activities will be followed by non-OE remediation. The final remediation
9 step will be an areawide clearance of soils within areas suspected of containing
10 OE below the surface scans, within future residential areas that will be
11 developed for residential use.

12
13 **2.3.1 Ordnance and Explosives Point Clearance**

14
15 **2.3.1.1 Surface Clearance.**

16
17 OE surface clearance activities involve a systematic search of the ground
18 surface visually and with hand-held geophysical search equipment using a
19 walking sweep line to clear each grid of OE, OE scrap, and non-OE surface
20 metallic debris. Hand-held geophysical search equipment will be used as an aid
21 to visually locate OE, OE scrap, and non-OE metallic debris on the surface.

22
23 The OE crew will visually identify each item as potential OE, OE scrap, or non-
24 OE metallic items. Potential OE items will be left where found for inspection by
25 the demolition crew. The location of OE and OE scrap will be documented. OE
26 scrap and non-OE metallic debris will be placed at the southwest corner of the
27 grid in which it was found for subsequent collection and disposal as appropriate.
28 OE, OE scrap, and non-OE metallic items will be identified and handled as
29 described in Chapter 4.0.

30
31 **2.3.1.2 Geophysical Investigation and Mapping.**

32
33 Geophysical performance verification tests will be performed to ensure that the
34 instrumentation meets the performance objectives, as specified in Chapter 3.0.

35
36 Geophysical data will be collected using EM instrumentation, specifically, an
37 MTADS because magnetometer systems can not detect nonferrous OE that
38 may be present at the site. Where the towed array cannot be used (mainly on
39 the steeper terrain and in portions of the South Valley wetlands), a dual-sensor,
40 hand-towed, portable geophysical detector will be used (man-portable adjunct
41 [MPA] MTADS). Approximately 70 percent of the Project Site will be mapped
42 with towed-array equipment; 30 percent of the Project Site will be mapped with
43 portable equipment. The performance capabilities and limitations of the EM
44 MTADS and MPA MTADS will be identified at an equipment test plot established
45 for this project.

46
47 Geophysical and location data from a Global Positioning System (GPS) will be
48 digitally collected and post-processed to identify anomaly locations. Identified

1 anomaly locations will be recovered in the field using real-time kinematic (RTK)
2 GPS instrumentation and marked for subsequent intrusive investigations.

3
4 **2.3.1.3 Ordnance and Explosives Subsurface Clearance.**

5
6 OE subsurface clearance includes:

- 7
8
 - 9 • Excavation and identification of geophysical anomalies
 - 10 • Removal of anomalies
 - 11 • Disposal of OE and OE scrap.

12 Each marked location will be excavated to identify the source of the anomaly.
13 OE dig teams will perform excavations using hand tools to uncover anomaly
14 sources at depths between the ground surface and approximately 2 feet bgs,
15 and a backhoe for anomaly sources deeper than 2 feet bgs. Non-digital, hand-
16 held EM equipment will be used to ensure personnel safety during intrusive
17 operations. The specific equipment will be identified and tested at the project
18 equipment test site prior to field use. Anomaly sources will be categorized as
19 OE, OE scrap, or non-OE debris. A detailed description of each recovered OE
20 anomaly will be recorded. All discovered OE will be explosively destroyed. The
21 procedures for OE and OE scrap disposal are described in Chapter 4.0.

22
23 **2.3.1.4 Point Clearance of Stockpiles #1, #2, and #3; Ridge Stockpiles #1**
24 **through #9; Debris Piles in Unit D-1 Area; Fill Areas in Sector 8; and**
25 **Sector 2.**

26
27 As part of point clearance activities, soil remaining from debris piles in Unit D-1
28 Stockpiles #1, #2, and #3, and Ridge Stockpiles #1 through #9 will be point
29 cleared in lifts. Heavy equipment will be used to spread out the soil. The
30 spread out stockpiles will be scanned in lifts with MPA MTADS geophysical
31 equipment operated by a qualified UXO Technician. The debris piles in Unit D-1
32 and Stockpiles #1, #2, and #3 will be scanned in a real-time (non-digital
33 recording) mode. The technician will identify and flag anomaly locations by
34 reference to the system audio output and digital display. After scanning and
35 removing the anomaly sources in soils from Stockpiles #1, #2, and #3, the soil
36 will be transported to a suitable landfill for disposal. The Ridge stockpiles #1
37 through #9 will be digitally scanned. The technician will record the anomaly
38 locations, the digital data will be analyzed to locate anomalies, and the
39 anomalies will be relocated in the field by a reacquisition team. Ridge stockpile
40 soils and soil remaining from the debris pile in Unit D-1 will either be temporarily
41 stored in Sectors 7, 10A, and 10B, or transported to a suitable landfill for
42 disposal.

43
44 Areas of the Project Site where on-site soils have been used as fill including the
45 Unit D-1 fill areas in Piercy Court (Sector 2) and the fill on the bottom of the
46 North Valley (Sector 8) will be point cleared in lifts. Each lift will be scanned with
47 MPA MTADS geophysical equipment operated by a qualified UXO Technician,
48 and all identified anomalies will be removed and, as necessary, OE items, OE
49 scrap and non-OE debris will be disposed of. Heavy equipment will be used to

1 remove the fill soils. Point clearance will continue in lifts until all the fill material
2 has been removed.

3
4 Excavated fill materials from the Unit D-1 fill areas will be temporarily stored in
5 Sector 10A or 10B until the North Valley has been prepared to accept fill soils.
6

7 **2.3.1.5 Quality Control Verification.**

8
9 A QC check of the detection and removal efficiency of the point clearance
10 process will be performed by re-mapping the entire site, recovering and
11 investigating any newly discovered anomalies, and categorizing the anomaly
12 sources. Any anomalies found during the re-mapping will be excavated as
13 described above. After each mapping/intrusive investigation activity is
14 complete, a QC evaluation will be performed and documented, as outlined in
15 Chapter 6.0.
16

17 **2.3.2 Remediation of TNT-Affected Soil**

18
19 TNT-affected soils with TNT concentrations of 10 percent or more by weight will
20 be homogenized to a depth of 2.5 feet bgs or deeper, as necessary, in the strips
21 that are devoid of vegetation. Field test kits and fix lab samples will be used to
22 determine if the homogenization process has been successful. The
23 homogenization process is described in Chapter 4.0.
24

25 **2.3.3 Areawide Clearance**

26
27 The areawide clearance activities on the Project Site will commence upon
28 completion of OE point clearance and, evaluation of OE site data, and will
29 include:
30

- 31 • Preparation of the North Valley to accept fill from the site.
- 32
- 33 • Removal of soils in future residential areas that at one time
34 contained OE or is considered to have a potential to contain OE or
35 within a 200-foot radius of an OE item that is in an area not
36 otherwise considered to have a potential to contain OE. These soils
37 will be placed in 8-inch lifts, scanned and used as engineered fill in
38 the bottom of the North Valley.
39

40 Grading on the Project Site may be (1) associated with the excavation of
41 previously placed fills (point clearance grading); (2) associated with areawide
42 clearance (areawide clearance grading); or (3) grading in an area that does not
43 meet the criteria for areawide clearance.
44

45 **2.4 SEQUENCE OF WORK**

46
47 The sequence of OE remediation activities has been planned to expedite
48 completion of the Tourtelot OE Remediation Project while maintaining strict
49 adherence to ensuring the health and safety of both project personnel and the

1 general public. The first area that will be remediated is the Unit D-1 area. This
2 area has been previously graded generally by cutting into bedrock to create
3 finished residential lots. OE clearances within the Project Site will progress in
4 the sequenced steps, as follows:
5

- 6 Step 1 Complete surface preparation activities across the Project Site including vegetation clearance, internal fence removal, and setting of grid stakes. Planned sector sequence is Sectors 10A/10B, 1, 2, 3, 9, 4, 7, 5, 6, and 8. Concurrent with site preparation is removal and off-site disposal of construction debris from debris stockpiles.
- 7 Step 2 Complete surface clearance activities across Project Site. All grids within 200 feet of the Project Boundary will be cleared followed by Sectors 10A/10B, 1, 2, 3, 9, 4, 7, 6, 8, and 5.
- 8 Step 3 Geophysically map, process data, and mark anomaly sources. Planned sector sequence is Sectors 10A/10B, 1, 3, 2, 4, 9, 8, 6, 5, and 7.
- 9 Step 4 Start point clearance activities across the Project Site. Planned sector sequence is Sectors 10A/10B, 1, 3, 2, 4, 9, 8, 6, 5, and 7.
- 10 Step 5 Point clear soils in Stockpiles #1, #2, and #3 in the North Valley, Stockpiles #1 through #9 on the Ridge, and stockpiles in Unit D-1. Relocate stockpiles to Sectors 7, 10A, and 10B, or dispose off site after they are cleaned.
- 11 Step 6 Repeat process in steps 4 and 5 across the Project Site as a QC process.
- 12 Step 7 Repeat process in steps 4 and 5, as necessary, in those grids that were identified during the second 100-percent geophysical mapping as still containing anomalies.
- 13 Step 8 Areawide clearance of the top of the south slope of the South Valley after completion of the QC scan of Sectors 1 and 3 (Unit D-1).
- 14 Step 9 Complete non-OE remediation; complete human health and ecological risk assessment.
- 15 Step 10 Evaluate point clearance data to assess if there are any areas of the Project Site that are not suspected of containing OE beneath the surface scans.
- 16 Step 11 Prepare North Valley to accept fill.
- 17 Step 12 Move temporarily stockpiled soils from Sectors 7, 10A, and 10B into the North Valley and scan the soils as they are being placed.

Table 2-1. Project Site Sector Description

Sector	Description
1	Unit D-1
2	Fill area in Unit D-1
3	The portions of the South Valley within 200 feet of Unit D-1 boundary
4	The portion of the South Valley that is within 1,181 feet of Matthew Turner Elementary school (maximum fragmentation distance of 37mm HE projectile)
5	The remainder of the South Valley outside the limits of construction. This sector includes Demolition Sites #1 and #3 and the Flare Site
6	Relatively undisturbed portions of the Ridge and South Valley within the limits of construction for residential development
7	The Ridge that has been previously excavated to bedrock
8	The bottom of the North Valley as defined by the maximum extent of alluvial and/or fill materials
9	The north slope of the North Valley including the TNT Strips and estimated maximum extent of TNT-affected soils
10A	Soils borrow area for fill in Unit D-1
10B	Field verification of geophysical performance evaluation and stockpile area on the Ridge for fill soils or soils that were temporarily removed for point or areawide clearance

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Figure 2-1 Project Site Sector Boundaries

Figure 2-2 Soil Stockpiles

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